HUMAN-COMPUTER INTERFACE

CLAIM OF PRIORITY

[0001] This application claims priority under 35 USC §119(e) to U.S. Patent Application Ser. No. 62/220,300, entitled "HUMAN-COMPUTER INTERFACE", filed on Sep. 18, 2015, the entire contents of which are hereby incorporated by reference.

BACKGROUND

[0002] The current standard methods for human interaction with computer and electronic devices ("human-computer interface") primarily and almost exclusively involve the hands.

[0003] A repetitive strain injury (RSI) is an "injury to the musculoskeletal and nervous systems that may be caused by repetitive tasks, forceful exertions, vibrations, mechanical compression, or sustained or awkward positions. RSIs are also known as cumulative trauma disorders, repetitive stress injuries, repetitive motion injuries or disorders.

[0004] Using a computer mouse, track pad, or touch screen requires a person to make small, exact, repetitive movements with his hand, fingers, and thumb. By positioning, travelling, scrolling, and clicking the mouse again and again, the soft tissues can become tired and overworked. This can cause pain (ache, soreness) on the top of the hand; pain (ache, soreness) around the wrist; pain (ache, soreness) along the forearm and entire upper extremity. Repetitive motion or cumulative trauma disorders including tendinitis and tendinosis, carpal tunnel and cubital tunnel syndrome, trigger fingers and other disorders related to soft tissue degeneration are common in the computer related work environment. Additionally, traumatic injuries, neurologic disorders, and birth disorders may limit function of the upper extremity and as such control of an electronic device may be impaired, with formation of painful nodules, and in the later stages, ganglion cysts, around the joints and along the tendons; and numbness and tingling in the thumb and index finger. If severe, using the fingers to tap, pinch, scroll etc. on a touch-screen device, in addition to other activities of daily living in the normal course of a day, may increase pain and decrease usefulness for the user.

SUMMARY

[0005] This specification describes technologies relating to human-computer interfaces.

[0006] In general, one innovative aspect of the subject matter described in this specification can be embodied in methods that include the act of receiving, from a capture sensor, information indicative of a state or position of landmarks of the face of the user. The methods include the act of determining that the user is performing one of a predetermined set of facial movements based on the information. The methods include the act of determining an input command based the determined facial movement. The methods also include the act of executing the input command to a computing device.

[0007] Other embodiments of this aspect include corresponding computer systems, apparatus, and computer programs recorded on one or more computer storage devices, each configured to perform the actions of the methods. A system of one or more computers can be configured to perform particular actions by virtue of having software,

firmware, hardware, or a combination of them installed on the system that in operation causes or cause the system to perform the actions. One or more computer programs can be configured to perform particular actions by virtue of including instructions that, when executed by data processing apparatus, cause the apparatus to perform the actions.

[0008] Particular embodiments of the subject matter described in this specification can be implemented so as to realize one or more of the following advantages. Instances of repetitive stress injuries in computer device users may be reduced. The experience of users who choose not, cannot or should not use a mouse can be improved.

[0009] The foregoing and other embodiments can each optionally include one or more of the following features, alone or in combination. The methods may include the act of comprising locating a cursor on a user interface of the computing device based on a position of a chin or a nose of the user. The position of the chin or the nose may be determined relative to another facial feature of the user. The methods may include the acts of causing a cursor to move based on the movement of the chin or nose of the user. The movement may be determined relative to other facial landmarks or as part of the face as a whole. The facial movement may include at least one of inflating a cheek of the user, sticking out of a tongue of the user, pursing lips of the user, and expanding corners of the lips. Inflating the cheek of the user may cause the computing device to execute to a mouse click input command. Determining the input command may include selecting between a click input command and a double click input command based on a timing and a repetition of the inflating of the cheek. Determining the input command may include selecting between a left click input command and a right click input command based on which check the user inflates. Sticking out of a tongue of the user may cause the computing device to execute to a scroll input command. The direction of the scroll command may be based on the direction of the tongue. Pursing the lips may cause the computing device to execute to a zoom in command. Stretching the lips may cause the computing device to execute to a zoom out command. The methods may include the act of detecting a facial expression indicative of at least one or calm, joy, surprise, fear, anger, disgust, trust, shame, contempt, anticipation, and sadness. The methods may include the act of adjusting the difficulty of a game based on the facial expression. The computing device may be one of a smart phone or tablet. The computing device may include a virtual reality headset. The computing device may enable the user to configure which input commands correspond to which facial movements. The capture sensor may be a camera.

[0010] The details of one or more embodiments of the subject matter described in this specification are set forth in the accompanying drawings and the description below. Other features, aspects, and advantages of the subject matter will become apparent from the description, the drawings, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 illustrates an example of a human-computer interface based on the facial movement of the user.

[0012] FIGS. 2A-C illustrates an example of controlling a computing device using the position of the chin or nose.

[0013] FIG. 3A-C illustrates the user controlling a computing device by inflating his checks.